2026 Form B Solutions

Clover Math Competition

May 1, 2026

1. Rewrite $\frac{3}{2}-\frac{5}{6}$ as $\frac{9}{6}-\frac{5}{6}=\frac{4}{6}=\boxed{\frac{2}{3}}$.

2. Recall that angles in a triangle sum to 180°. Because the first two are given, the degree measure of the third angle is $180-20-26=\boxed{134}$.

3. Each flip has a $\frac{1}{2}$ probability of landing tails. Since this occurs 2 times, and we want it to happen both times, the desired probability is $\left(\frac{1}{2}\right)^2=\boxed{\frac{1}{4}}$.

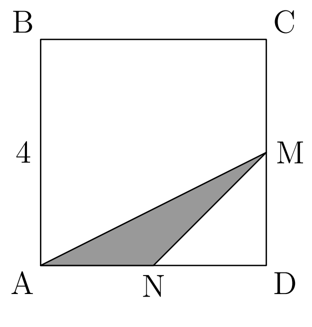
4. A square has 4 sides, and so its perimeter would be $3\cdot 4=12$ inches. The other regular polygon has side length 1 inch, and so it must have $\boxed{12}$ sides to get the desired perimeter of 12 inches.

5. The only odd 2-digit perfect squares are $5^2=25$, $7^2=49$, and $9^2=81$. The sum of the digits is given to be a perfect square, and only $\boxed{81}$ with its digit sum of $9=3^2$ satisfies that property.

6. We basically want to find the value of $\frac{2026}{45}$, then round down because that is the maximum number of full copies that Katelyn can make. Long division would yield that $\frac{2026}{45}=45+\frac{1}{45}$, giving the answer $\boxed{45}$.

7. There are 6 horizontal lines and 8 vertical lines. Note that for each of the horizontal lines, exactly 8 intersections with the vertical lines occur. Then the answer is $8\cdot 6=\boxed{48}$.

8. We can draw the diagram as shown below. The area of a triangle is $\frac{1}{2}bh$, where b is the base and h is the height. Here, we can set AN as the base and MD as the height. We know that they are both equal to $\frac{4}{2}=2$, because of the given midpoint conditions, so therefore the area of $\triangle AMN$ is $\frac{1}{2}\cdot 2\cdot 2=\boxed{2}$.



9. Let the length of the shorter side be x, so that the length of the longer one is $2x$. Since the area of $2x\cdot x=2x^2$ is equal to the perimeter of $2(x+2x)=6x$, then

$$2x^2=6x \implies x=3$$

upon division of both sides by $2x$ (which we can do since $x\neq 0$). Then the longer side is length $2x=\boxed{6}$.

10. Rewrite the expression as $68\cdot 22+68\cdot 78=68(22+78)$, so evaluating the parentheses first makes the computations much easier. Then the answer becomes $68\cdot 100=\boxed{6800}$.

11. Make the observation that $20266=20260+6$. If x is the greatest common divisor of the two, then because x divides 20260 and $20260+6$, then x must divide 6. It can be verified that 2 does indeed divide into both 20260 and 20266, since the units digit is even. But they are not divisible by 3, because the sum of their digits isn't divisible by 3 using the divisibility rule for 3. Then our answer is $\boxed{2}$.

12. Consider the two dice separately. For each of them, there is a $\frac{5}{6}$ that they roll something other than a 1.

But we want this to happen for both of them, so we multiply the probabilities together to get $\left(\frac{5}{6}\right)^2 = \boxed{\frac{25}{36}}$.

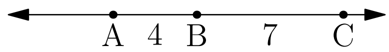
13. Each of the 24 hours essentially contributes 60 minutes, so we multiply these together to obtain the number of minutes per day as $24 \cdot 60 = \boxed{1440}$.

14. The key idea is that one of the primes must be 2. This is because had neither of them been 2, then both of them would be odd. But the sum of two odds is even, which contradicts with the given odd sum of 39. So they can't both be odd, and one of them is 2.

Then subtraction would reveal that the other prime number must be 37, making their product $2 \cdot 37 = \boxed{74}$.

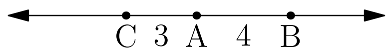
15. Place Abel and Beth first on a line in that order. Note that this can be done because had they been placed the other way around, we could just reflect the diagram over and it wouldn't change their distances. We will perform casework on which direction Charlie is placed relative to Beth.

Case 1: Charlie is to the right of Beth



Then we obtain the situation shown. It remains to place Darelyn into the diagram. If Darelyn is to the right of Charlie, then she would be 16 houses away from Abel. If Darelyn is to the left of Charlie, then she would be 6 houses away from Abel. Neither scenario fits the 8 houses given, so this case cannot happen.

Case 2: Charlie is to the left of Beth



Then we obtain the situation shown. Here, Charlie is 3 to the left of Abel. If Darelyn is to the right of Charlie, then she would be 2 houses away from Abel, which doesn't work. However, if Darelyn is to the left of Charlie, then indeed, she would be 8 houses away from Abel. So this scenario would work, and here Abel would be $\boxed{3}$ houses away from Charlie.

Remark: This "puzzle" problem was inspired from deciphering linear order of genes on a chromosome using given recombination frequencies.

16. When Charles was born, suppose Allison was $2x$ years old and Bob was x years old. Then y years later coming to the present, Charles is y years old, Bob is $x + y$ years old, and Allison is $2x + y$ years old. The sum of the three ages currently is given to be 42, so

$$y + (x + y) + (2x + y) = 3x + 3y = 42 \implies x + y = 14.$$

But this is precisely Bob's age, $x + y$, so the answer is $\boxed{14}$.

17. Note that the condition is equivalently just asking for the last letter to be a B rather than an A. But those two conditions are equally likely, since we can just "flip" each letter and obtain another sequence with the other last letter, showing that the number of sequences with each is equal. Thus the answer is $\boxed{\frac{1}{2}}$.

18. Observe that

$$11^2 = 121 < 132 < 144 = 12^2,$$

so $11 < \sqrt{132} < 12$. To determine if it is 11 or 12, consider the point where it changes, which would be 11.5. We can evaluate $11.5^2 = 132.25$, which is greater than 132. Then

$$121 < 132 < 132.25 \implies 11 < \sqrt{132} < 11.5,$$

so $\sqrt{132}$ would round down. The answer would follow as $\boxed{11}$.

19. First consider the conditions that remainder when it is divided by 5 is 3, and the remainder when it is divided by 3 is 1. Listing the numbers with a remainder of 3 when divided by 5, there is 3, 8, and then 13. But 13 would be the first one satisfying those two conditions.

After that, the next ones would need to be multiples of $\text{lcm}(3,5) = 15$ higher than 13 to preserve the remainders when divided by 3 and 5. But we want the positive integer to also be even, or divisible by 2. However, just adding 15 once would achieve this result, giving us $\boxed{28}$.

Alternate Solution: This problem can be completed slightly faster using modular arithmetic. We are essentially given the system shown below, and want to find the smallest positive integer n satisfying them.

$$\begin{cases} n \equiv 0 \pmod 2 \\ n \equiv 1 \pmod 3 \\ n \equiv 3 \pmod 5 \end{cases}$$

However, observe that each remainder is two less than the divisor. So we can rewrite the system as

$$\begin{cases} n \equiv -2 \pmod 2 \\ n \equiv -2 \pmod 3 \\ n \equiv -2 \pmod 5 \end{cases} \implies n \equiv -2 \pmod{30}.$$

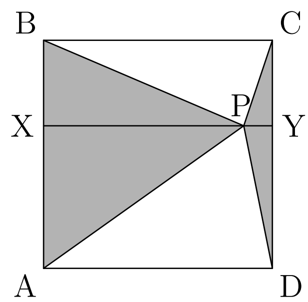
From this our answer would quickly follow to be $\boxed{28}$.

20. Suppose the positive integer is $10a + b$, where a and b are digits. We are given that $10a + b = ab + a + b$, the result of adding the product with the sum, so simplifying gives $9a = ab$. However, because a is nonzero (it is given that they are two-digit positive integers), then we can divide both sides by a to see that $b = 9$. This is the only condition required. Then our such numbers would be $19, 29, 39, \cdots, 99$. Summing all 9 of them, either by brute force or noting that the average value is 59, would give the answer of $\boxed{531}$.

21. Note that the probability of the second roll being greater than the first roll is equal to the probability that the first roll is greater than the second roll, due to symmetry. But any roll can either have the first roll greater, the second roll greater, or both equal. The probability that both are equal is $\frac{6}{36} = \frac{1}{6}$ because there are 6 ways to be equal, so the answer is $\frac{1}{2}\left(1 - \frac{1}{6}\right) = \boxed{\frac{5}{12}}$.

22. There are two solutions to this problem.

Solution 1: Let a horizontal line through P meet AB and CD at points X and Y, as shown.



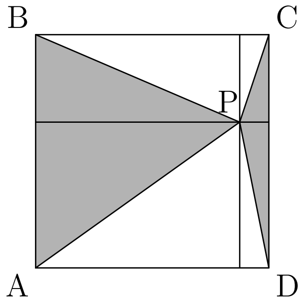
The area of a triangle is half of base times height. In $\triangle ABP$, its base is AB and the height to that base is XP. Similarly, in $\triangle PCD$ the base is CD and the height is PY. So the sum of their areas would be

$$\frac{1}{2}(AB)(XP) + \frac{1}{2}(CD)(PY).$$

But $AB = CD = 12$ and $XP + PY = XY = BC = 12$ by using the side length of the square. Then simplification yields

$$\frac{1}{2}(AB)(XP) + \frac{1}{2}(CD)(PY) = 6XP + 6PY = 6(XP + PY) = 6(12) = \boxed{72}.$$

Solution 2: Draw vertical and horizontal lines through P, as shown.



The square would be broken up into four rectangular regions. In each of them, a triangle bounded by a diagonal and the sides is shaded. Each shaded portion would constitute half the area in each rectangle, since a diagonal breaks a rectangle into two identical triangles. Summing all of these reveals that the total shaded area is actually just half of the square's area, so the answer would quickly become $\frac{1}{2}(12)^2 = \boxed{72}$.

23. In the first half, because it's given he caught 25% of the balls thrown at him, Timmy had caught $\frac{25}{100} \cdot 12 = 3$ of the 12 balls. Suppose in the second half that he caught x balls, so that he was thrown $2x$ balls. Then the total number he caught is $x + 3$, compared to the total thrown at him which was $2x + 12$. We want this to equal $44\% = \frac{44}{100} = \frac{11}{25}$. So then we get the equation

$$\frac{x+3}{2x+12} = \frac{11}{25}.$$

We can cross multiply to see that $25(x+3) = 11(2x+12)$, so $25x+75 = 22x+132$. Then $3x = 132-75 = 57$, so $x = 19$. We are trying to find the total number of balls he caught in the game, so we need to add the first half too. Then our answer is $19 + 3 = \boxed{22}$.

24. This problem can be solved by casework on the direction of the line. We will express this formally using slope, but an intuitive understanding of direction would suffice during the contest. Our casework will begin from vertical, and then gradually spin clockwise.

Case 1, vertical: Then there are only 3 ways.

Case 2, slope 2: There are 2 ways.

Case 3, slope 1: There are 3 ways.

Case 4, slope $\frac{1}{2}$: There are 2 ways.

Case 5, horizontal to slope -2: These are just 90° rotations of the previous 4 cases, and since the grid also has rotational symmetry, this count would be equal to the sum of the counts above.

Adding all of these gives our answer, $2 \cdot (3 + 2 + 3 + 2) = \boxed{20}$ lines.

Remark: This problem can also be solved in a more advanced way. Just picking any two points would yield $\binom{9}{2} = 36$ pairs. This would technically get all the lines, but it would overcount those with three points on it. Observe that since each line with three points is counted $\binom{3}{2} = 3$ times by picking pairs, we need to subtract each of these lines twice to get the correct count. There are 3 horizontal, 3 vertical, and 2 diagonal lines with three points on them. Therefore, the answer would follow as $36 - 2(3 + 3 + 2) = 20$ again. This strategy is the basis of a higher-level combinatorial technique called the Principle of Inclusion-Exclusion.

25. In every hour, Bob would paint $\frac{1}{2}$ of the fence, while Tony would paint $\frac{1}{3}$ of the fence. When both of them work together for the first hour, they would paint $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ of the fence. Once Tony has to leave, then Bob is left to paint the remaining $\frac{1}{6}$ of the fence.

But if Bob can paint $\frac{1}{2}$ of the fence in 1 hour, or 60 minutes, then he can paint $\frac{1}{6}$ of the fence in 20 minutes since it is given that their work rates are constant throughout all of this time. But this is precisely what is asked, and so the answer is $\boxed{20}$.

26. Suppose an apple costs a, a banana costs b, and a cherry costs c, in dollars. We are given that $a+2b+3c = 10$ and $a + 4b + 6c = 17$. Multiply both sides of the equation $a + 2b + 3c = 10$ by 2 to get $2a + 4b + 6c = 20$. We have the other given equation $a + 4b + 6c = 17$, so if we subtract that, then we get the new one

$$(2a + 4b + 6c) - (a + 4b + 6c) = 20 - 17 \implies a = 3.$$

Therefore, the price of the apple has to be $\boxed{3}$ dollars.

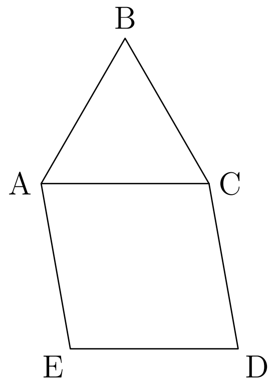
27. Consider the prime factorization of any divisor of $3^4 \cdot 5^3 \cdot 7^5$. The only prime factors it could have would be 3, 5, and 7, because otherwise it wouldn't divide into the given number. So suppose the divisor's prime factorization is $3^a \cdot 5^b \cdot 7^c$ for some nonnegative integers a, b, and c.

Additionally, for that number to be a divisor of the given one, its exponents need to be less than or equal to the corresponding exponents in the given number. So for example, this is how 3^5 doesn't divide $2^6 \cdot 3^4$. So given nonnegative integers a, b, and c, we require $a \leq 4$, $b \leq 3$, and $c \leq 5$.

But for the divisors to be a perfect square, their exponents need to be even. So a must be 0, 2, and 4. For b, it can only become 0 or 2, while for c, it can be 0, 2, or 4.

For each of those exponents, we can decide them independently of the other ones. So the total number of ways to pick those exponents is the number of perfect square divisors of the original given number. This count would be $3 \cdot 2 \cdot 3 = \boxed{18}$ perfect square divisors.

28. Firstly draw the diagram, like as shown below. We can draw AC into the picture.



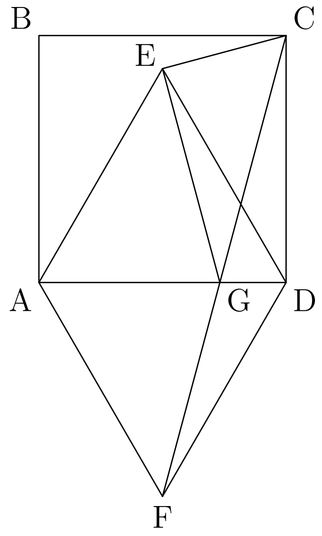
Let's take a look at $\triangle ABC$. Because all sides in pentagon $ABCDE$ are equal, then $AB = BC$. This would imply that $\angle BAC = \angle BCA$ because $\triangle ABC$ is isosceles. Suppose that $\angle BAC = x = \angle BCA$. The three angles sum to $x + x + 60 = 180$, which we can solve to see that $x = 60$. So in fact we have that $\angle ABC = \angle BCA = \angle CAB = 60°$, and therefore $\triangle ABC$ is equilateral. Then $AB = BC = AC$, so $AC = CD = DE = EA$. This would tell us that $ACDE$ is a rhombus.

We know that a rhombus has opposite sides parallel. Because we are given that $\angle EAB = 140°$, then $\angle EAC = 80°$. Combined with the fact that $\angle EAC + \angle ACD = 180°$ by our parallel condition, we find that $\angle ACD = 100°$. But then $\angle ACB = 60°$, so we conclude that $\angle BCD = 60° + 100° = 160° \implies \boxed{160}$.

29. Suppose the ant started at 0. After moving 6 times, we are trying to find the probability that it is at either 2 or -2. Due to symmetry, we can just consider the probability that it goes to 2, then multiply the probability for that by 2. If we had r right steps and l left steps, then we are given that $r + l = 6$ because there are 6 total steps. But because it goes to the spot labeled 2, then that suggests there were 2 more right steps than left steps, so $r - l = 2$.

We have our two equations, and so adding them gives $2r = 8 \implies r = 4$ and therefore $l = 2$. So we are trying to count the number of ways to arrange four right steps and two left steps. This is equivalent to $\binom{6}{2}$ by choosing the two which are left steps, which can be computed as 15. The total number of possible paths the ant could go is determined by which direction it goes for each of the six steps, which is 2^6. So the probability it goes to 2 is $\frac{15}{64}$, and so the answer to the problem is $\frac{15}{64} \cdot 2 = \boxed{\frac{15}{32}}$.

30. Consider the diagram shown. We will present two solutions.



Solution 1: Within $\triangle FCD$, we see that

$$\angle FDC = \angle FDA + \angle ADC = 60^\circ + 90^\circ = 150^\circ.$$

Since $FD = AD = CD$, then $\angle CFD = \angle FCD$. It can be found through a little algebra from there that

$$\angle FCD = \angle CFD = \frac{180^\circ - 150^\circ}{2} = 15^\circ.$$

However, note that because F is essentially the reflection of E over AD, then $\triangle FGD$ is the reflection of $\triangle EGD$ over AD, meaning the two triangles must be congruent. Therefore,

$$\angle GED = \angle GFD = \angle CFD = 15^\circ.$$

Now, we are trying to find $\angle CEG$, and we have $\angle DEG$. So it remains to find $\angle DEC$. But notice how $\triangle EDC$ is also isosceles with $ED = CD$, since $ED = AD = CD$. But additionally, we can find that

$$\angle CDE = \angle CDA - \angle EDA = 90^\circ - 60^\circ = 30^\circ,$$

so because $\angle CED = \angle ECD$, then they must be equal at $\frac{180^\circ - 30^\circ}{2} = 75^\circ$. Then our answer would become

$$\angle CEG = \angle DEG + \angle DEC = 15^\circ + 75^\circ = 90^\circ \implies \boxed{90}.$$

Solution 2: We can find $\angle FCD = 15^\circ$ and $\angle ECD = 75^\circ$, like shown in solution 1. This would then mean that $\angle ECG = 60^\circ$. However, we know that $\angle EDG = 60^\circ$ as well, implying that $ECDG$ is cyclic. Then since $\angle CDG = 90^\circ$ and opposite angles of cyclic quadrilaterals are supplementary, it can be easily found that $\angle CEG = 90^\circ$ as a result, yielding the same answer $\boxed{90}$.

Problem Credits:

Ethan Zhang proposed all 30 problems.